

Two new species of *Lauxania* Latreille s. str. (Diptera, Lauxaniidae) from Southern Europe

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Two new species of *Lauxania* Latreille s. str. (Diptera, Lauxaniidae) from Southern Europe. - Three species of *Lauxania* s. str. are known from Europe: *L. cylindricornis* (Fabricius) and the two new species *L. bilobata* sp. n. (Southern France, Drôme) and *L. siciliana* sp. n. (Sicily, Mt. Etna). All species are described and illustrated. The two new species form a monophyletic group based on the strongly asymmetrical postgonites. They differ from each other in males in the structure of the brush of black setulae at the tip of the hind tibia ventrally and in details of the male terminalia (surstylus, hypandrium). A key to the European species of *Lauxania* s. lat. is presented.

Key-words: Diptera – Lauxaniidae – *Lauxania* s. str. – new species – Europe.

INTRODUCTION

The Lauxaniidae are among the most abundant acalyptrate Diptera in forest ecosystems in the temperate and tropical parts of the world. Their larvae are saprophagous or mycetophagous and play therefore an important role in the decomposition of leaf litter (Miller, 1977; Broadhead, 1984; Papp & Shatalkin, 1998). Nevertheless, our knowledge of this family is still rudimentary. Even in the comparatively well studied western Palaearctic region, from which some 150 species have been described, many new species are waiting to be named. In addition, Stuckenberg (1971) pointed out that many genera of Old World Lauxaniidae are insufficiently characterized, because of the lack of phylogenetic studies.

A good example for the changing history in its generic limits is demonstrated by *Lauxania* Latreille: Originally, Latreille (1804) described the genus for one species, *Musca cylindricornis* Fabricius. Later, Meigen (1826) placed in *Lauxania* all metallic shining Lauxaniids with a depression on the face and with elongated, feathery antennae, such as species now placed in *Calliopum* Strand, *Pachycerina* Macquart and *Minettia* Robineau-Desvoidy. This concept was more or less accepted by subsequent authors (Loew, 1847; Becker, 1895; Hendel, 1908). An alternative classification was first proposed by Westwood (1840), who suggested that only species with the scape distinctly longer than the pedicel, and with the transverse

depression on the face, should be assigned to *Lauxania*. As a consequence, only *L. cylindricornis* remained in the genus. This classification was later adopted by Rondani (1877), Czerny (1932), Stuckenberg (1971) and all subsequent authors. Martinek (1974) added *L. minor*, a new species from the Czech and Slovak republics. This species was later placed by Papp (1978) in the new subgenus *Callixania*. This taxon may warrant generic rank according to Papp & Shatalkin (1998). Another seven species were described in *Lauxania* from the eastern parts of the Palaearctic region by Elberg, Remm and Shatalkin in the past 20 years (Shatalkin, 1993). In his review of the Palaearctic Lauxaniidae, Shatalkin (2000) keyed all species, synonymized some species described from the eastern Palaearctic region and described the new subgenus *Czernushka* for the transpalaearctic species *L. albomaculata* Strobl. Unfortunately, this new taxonomic proposal is not accompanied by a phylogenetic discussion. Further studies are necessary to confirm whether the three morphologically very different subgenera of *Lauxania* form indeed a monophyletic group.

Following Shatalkin (2000), *Lauxania* is characterized among the Lauxaniinae by its black body, the transverse depression on the face, the black base of the wing, the absence of intraalar and presutural dorsocentral setae, and the virtually bare anepimeron. It is separated from *Calliopum* only by the white arista and the usually black knob of the halteres. However, both characters occur in the two genera. Thus, further studies are needed to propose a more convincing classification (Merz, in preparation).

In contrast to the genus, the subgenus *Lauxania* s. str. is well defined. It has elongated antennal segments, distinct rays on the arista, and a unique shape of the transverse depression on the head. A habitus drawing was given by Papp (1979). It has a Holarctic distribution, with five species in the Nearctic region (Pérusse & Wheeler, 2000) and six species in the Palaearctic region (Shatalkin, 2000) one of which, *L. cylindricornis*, occurs in Europe.

In the present paper, two new species of *Lauxania* s. str. are described from the Mediterranean region. They differ from each other mainly in the structure of the male terminalia. The material for this study is deposited in the following institutions and private collections: Hungarian Natural History Museum (HNHM), Muséum d'histoire naturelle, Genève (MHNG), Zoological Museum University Copenhagen (ZMUC), the private collections V. Korneyev, Kiev (CVK), V. Martinek, Dobruska (CVM) and the author's collection (CBM). Terminology in the descriptions follows Papp & Darvas (2000).

SYSTEMATIC PART

Lauxania (s. str.) *bilobata* sp. n.

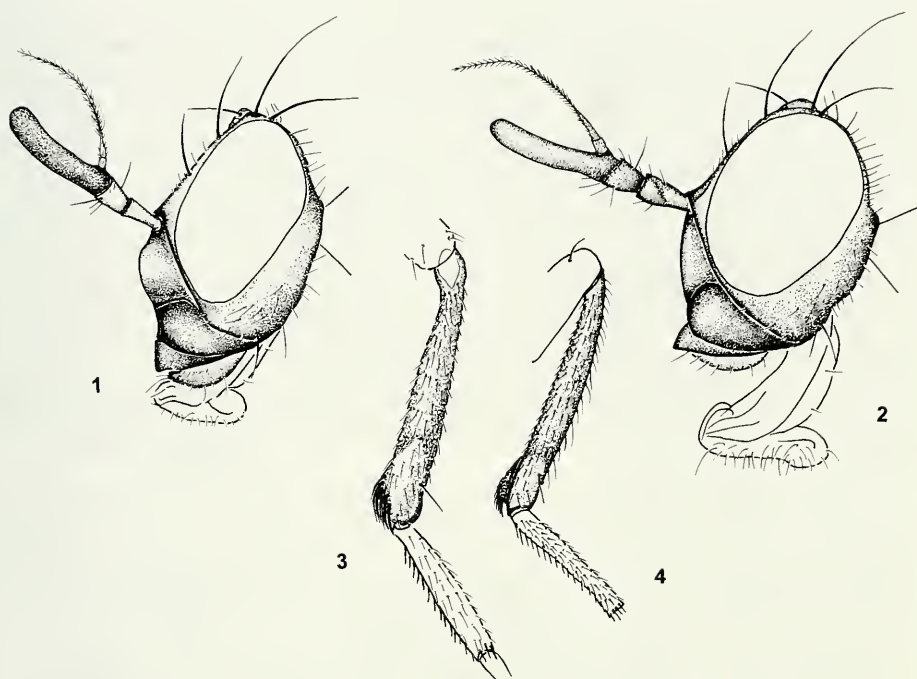
Figs 1, 3, 10-13

MATERIAL

Holotype ♂: France: Drôme, 820-950m, Chalancon, Col des Roustans (D135), 11.VII. 1999, leg. B. Merz. The holotype is double mounted on a minuten pin on a polyporus strip and is in excellent condition. It is deposited in the MHNG. Paratypes: 4♂♂, same data as holotype (CBM, MHNG).

ETYMOLOGY

The two anterior lobes on the hypandrium are very conspicuous and separate this species from the similar *L. siciliana*.



FIGS 1-4

Head in profile (1-2) and hind tibia of males (3-4) of *Lauxania* s. str.: 1, *L. bilobata* sp. n.; 2, *L. cylindricornis* (Fabricius); 3, *L. bilobata* sp. n.; 4, *L. siciliana* sp. n.

DIAGNOSIS (male)

Shining black species of 3.00-3.35 mm wing length. Scape and pedicel mostly yellow; arista yellowish, its rays about twice as long as base of arista; scape and pedicel subequal in length (Fig. 1); acrostichal setulae usually in 6 more or less regular rows. Hind tibia at tip with a brush of rather long, black setulae over most of ventral surface (Fig. 3). Terminalia: surstylus slightly higher than wide in profile, without protuberance; postgonites asymmetrical: left postgonite halter-like, right postgonite rudimentary; hypandrium anteriorly with two large lobes; posteriorly truncate (Figs 10-13).

DESCRIPTION (male)

Head (Fig.1). Shining black; parafacialia, gena and postgena silvery microtrichose; interfrontal stripe, fronto-orbital plate and occiput thinly microtrichose; palpus black; scape and pedicel yellow or only indistinctly infuscated, 1st flagellomere black; arista yellowish throughout. Head in profile about 1.5 times higher than wide; gena about one quarter as high as compound eye in profile; fronto-facial angle about 150°; frons and face of subequal length; distance between bases of antennae three times the diameter of the scape; dorsal half of occiput strongly convex; face with a

transverse depression on ventral third, which does not reach the oral margin medially; antenna: ratio scape:pedicel:1st flagellomere = 8:9:35; pedicel dorsally at base with one seta and ventrally in distal half with few long setae; rays of arista distinct, about twice as long as diameter of base of arista; frons almost bare with only few setulae laterally. Chaetotaxy: 2 reclinate fronto-orbital setae, 1 rather short ocellar seta, 2 vertical setae, 1 postocellar seta, one row of black postocular setae.

Thorax. Subshining black, covered with very thin microtrichosity, entirely shining on a patch in anterior half of anepisternum; acrostichal setae in 6 more or less regular rows; prescutellar seta slightly shorter than anteriormost dorsocentral seta; 0+3 dorsocentral setae, increasing in size towards scutellum; 1 postpronotal seta; 2 notopleural setae; 1 presutural intraalar seta; 1 supraalar seta; 2 postalar setae; 1 propisternal seta; 1 anepisternal seta; 2 katepisternal setae, of which the anterior is shorter and weaker; prosternum setulose; anepimeron bare; scutellum with long basal and apical setae. Calyptra black; halter black; wing yellowish tinged, but base including alula darkened.

Legs (Fig. 3). Black, but knees of anterior leg, tip of mid tibia and posterior four tarsi yellowish, the last segment of the posterior four tarsi sometimes slightly brownish; all tibiae with a dorsal preapical seta, the one on hind tibia shorter. Male: hind tibia slightly swollen apically, with a distinct, well defined brush of long black setulae on ventral half.

Preabdomen. Subshining black with very thin microtrichosity; all tergites with short setulae, those on hind margin of the tergites slightly longer.

Male terminalia (Figs 10-13). Epandrium a semicircle; surstylus compact, in profile higher than wide, with convex posterior margin and a concave medial plate; bacilliform plate large, anteriorly upcurved; hypandrium posteriorly open, anteriorly with a pair of outstanding lobes, posteriorly abruptly cut; postgonites strongly asymmetrical: left gonite halter-like, with a distinct knob distally; right gonite rudimentary; pregonites forming a closed circle, well separated from the postgonites, anteriorly produced in a large plate; phallapodeme large, spatulate; aedeagus membranous, indistinctly and weakly sclerotized near apex; ejaculatory apodeme sclerotized, bowl-shaped.

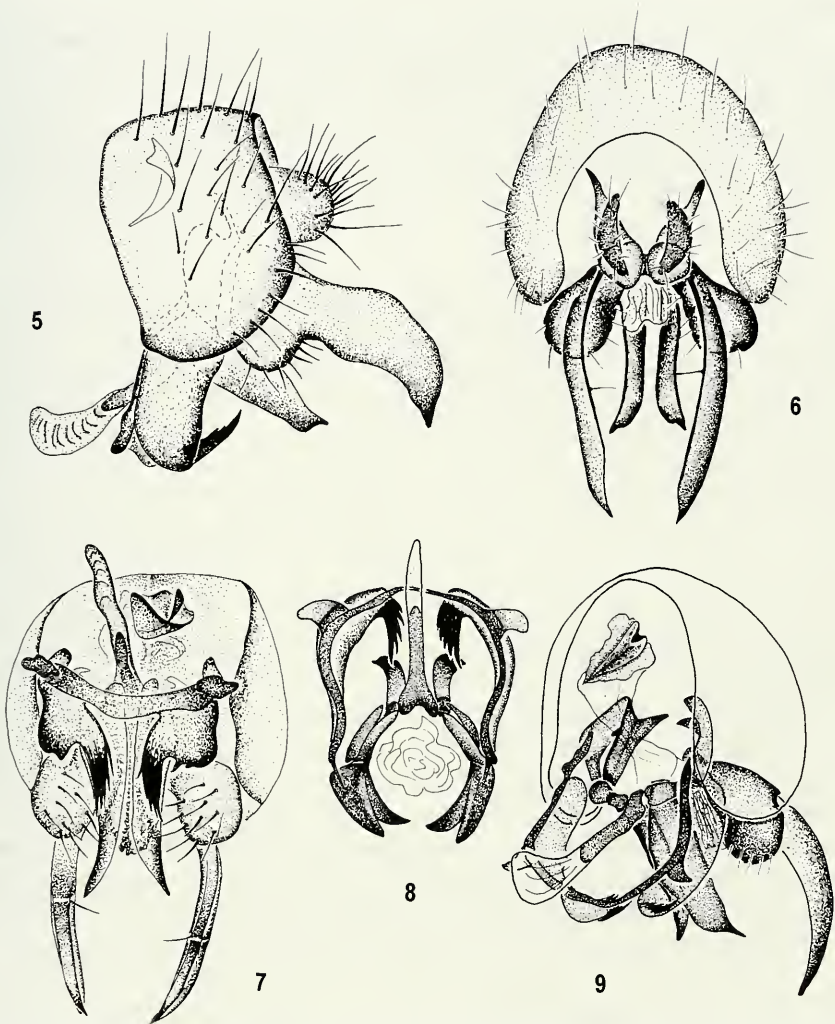
Female: unknown.

BIOLOGY

The adults were swept on shrubs and low trees (mainly *Populus* and *Alnus*) along a small stream in a small valley which opens to the south.

DISCUSSION

This species differs from *L. siciliana* only in the characters given in the key. The structure of the tip of the hind tibia in males is the only stable external difference (Figs 3-4). Two males of both species were dissected and they do not show any intraspecific variation. Therefore, it is proposed here that the two populations from Southern France and Sicily represent two distinct species. Because the Eastern Palearctic species were not available for study, the relationships of the two species with other species of the subgenus are unknown.



FIGS 5-9: Male terminalia of *Lauxania cylindricornis* (Fabricius): 5, lateral view; 6, posterior view; 7, anterior view; 8, dorsal view, epandrium and surstylus omitted; 9, anterolateral view.

Lauxania (s. str.) *cylindricornis* (Fabricius, 1794)

Figs 2, 5-9, 18-21

Musca cylindricornis Fabricius, 1794: 332. Type locality: France. Type material lost (Martinek, 1974).

Musca chrysoptera Schrank, 1803: 126. Synonymy by Meigen (1826).

Lauxania rufitarsis Latreille, 1805: 390. Synonymy by Latreille (1805).

MATERIAL

Switzerland: numerous specimens from the following cantons: GL, GR, SH, VS, ZH (CBM, MHNG); Danmark: Lolland (ZMUC); Ukraine: Kiev region (CVK); Czech and Slovak Republics: various regions (CVM).

DIAGNOSIS

Shining black species of 2.9-3.3 mm wing length in males and 3.1-3.4 mm in females. Antennae mostly dark; arista with comparatively short rays; scape about 1.5 times as long as pedicel (Fig. 2); acrostichal setulae usually in 4-5 rows. Male: hind tibia at tip with inconspicuous brush of short, black setulae ventrally; surstylus with characteristic protuberance; hypandrium with 2 lobes anteriorly carrying each some 5-7 black, ventrally directed setulae; pregonites with 2 ventrally directed processes (Figs 5-9).

DESCRIPTION

Head (Fig. 2). Shining black, but parafacialia and postgena silvery microtrichose; interfrontal stripe, fronto-orbital plate and occiput slightly microtrichose; palpus black; scape pale at base, distal half and pedicel dark brown to black, 1st flagellomere black; arista yellow in basal thickened part, remainder white. Head in profile about 1.3-1.4 times as high as wide; gena about one third as high as compound eye in profile; fronto-facial angle about 135°; frons and face of the same length; distance between antennae at base about 3 times the diameter of the scape; face with distinct „v“-shaped depression medially reaching oral margin; antenna: ratio scape: pedicel:1st flagellomere = 13:9:40; pedicel dorsally at base with one seta and ventrally in distal half with few long setulae; rays of arista distinct, about as long as diameter of base of arista; occiput in dorsal half strongly concave; frons anteriorly setulose. Chaetotaxy: 2 reclinate fronto-orbital setae, 1 rather short ocellar seta, 2 vertical setae, 1 postocellar seta, one row of black postocular setae.

Thorax. Subshining black, covered with very thin microtrichosity, only a patch in anterior half of anepisternum fully shining; acrostichal setae on level of suture in 4-5 irregular rows; prescutellar seta shorter than the anteriormost dorsocentral seta; 0+3 dorsocentral setae; 1 postpronotal seta; 2 notopleural setae; 1 presutural intraalar seta; 1 supraalar seta; 2 postalar setae; 1 proepisternal seta; 1 anepisternal seta; 2 katepisternal setae, of which the anterior is shorter and weaker; prosternum with 1-2 fine setulae; anepimeron bare; scutellum with strong basal and apical setae. Calyptra black; halter black; wing with yellowish tinge, but base including alula darkened.

Legs. Black, but anterior knees, tip of mid tibia and posterior four tarsi yellowish; last segment of posterior four tarsi usually blackish; all tibiae with a dorsal preapical seta, the one on hind tibia shorter. Male hind tibia apically with a rather indistinctly defined brush of short, black setulae on ventral side.

Preabdomen. Subshining black with very thin microtrichosity; all tergites shortly setulose, with slightly longer setulae on hind margin of tergites.

Male terminalia (Figs 5-9). Epandrium a semicircle; surstylus divided into a bulbous base and a flattened, crescent-shaped protuberance which is often curved medially; hypandrium posteriorly open, ventrobasally with a pair of large lobes which are covered with a patch of 5-7 close-set, black, ventrally directed strong setae; postgonites fused with hypandrium and pregonites; the latter separated from each other, and with a pair of sclerotized, symmetrical, ventrally directed protuberances emerging from their anterior half; phallapodeme large, spatulate; aedeagus membranous, soft; ejaculatory apodeme sclerotized, irregular in shape; bacilliform plate forming a pair

of bulbous posterior knobs which are produced anteriorly into an acute tip; knobs connected by a narrow sclerotized bridge.

Female terminalia (Figs 18-21). Shape rather complex, in particular sternite 8, which has a deep, lateral depression and the ventral part distally upcurved; sub-anal plate large, densely setulose; supra-anal plate and tergite 8 obviously fused. Three spermathecae of smooth surface present; the simple spermatheca larger, egg-shaped; the paired spermathecae small, roundish.

DISTRIBUTION

A widely distributed species in the whole Palaearctic region (Papp, 1984; Shatalkin, 2000). Based on the available checklists, the species is recorded from the following countries: Mongolia, Russia, Baltic countries, Ukraine, Romania, Hungary, Poland, Czech and Slovak Republics, Germany, Denmark, Finland, Sweden, Norway, Ireland, Great Britain, Netherlands, Belgium, France, Switzerland, Italy. However, the records from the Mediterranean region need re-examination, because they may refer to the two new species described in this paper. The Nearctic records published so far under *L. cylindricornis* belong to a new species, *L. shewelli* PÉrusse & Wheeler (PÉrusse & Wheeler, 2000).

BIOLOGY

This species is common at low altitudes in rather hot and dry places. At locally warmer places, *L. cylindricornis* may be found up to 1600m (inner alpine valleys of Switzerland). Contrary to other Lauxaniidae this species is more common on grass and low shrubs, and may only occasionally be found in open forests. Its flight period ranges from April to July.

DISCUSSION

As indicated in key and diagnosis, this species differs considerably from the other two European species of the subgenus. The spines at the ventral base of the hypandrium are also present in some *Calliopum* (*C. simillimum* Papp, *C. elisae* Meigen), and these species may form a monophyletic group (PÉrusse & Wheeler, 2000; own observations). Further studies, however, are needed to confirm this hypothesis.

Lauxania (s. str.) *siciliana* sp. n.

Figs 4, 14-17, 22-25

MATERIAL

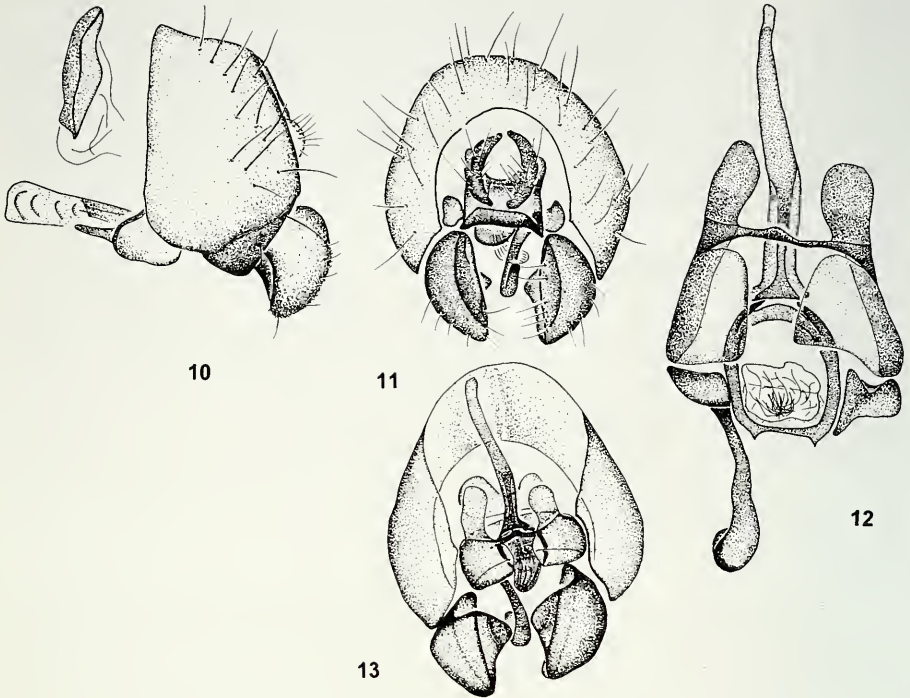
Holotype ♂: Italy: Sicily, 1450m, Etna, Piano delle Donne, 5.VI.1999, leg. B. Merz. The holotype is double mounted on a minuten pin on a polyporus strip and is in excellent condition. It is deposited in the MHNG. Paratypes: 2♂♂, 5♀♀, same data as holotype (CBM, HNHM, MHNG).

ETYMOLOGY

This species is named after the type locality.

DIAGNOSIS

This shining black species of 3.0-3.3 mm wing length in males and 3.15-3.30 mm in females differs from *L. bilobata* in the shape of the male hind tibia and details of the terminalia. Apex of hind tibia (Fig. 4) with a small plate ventrally which is



FIGS 10-13

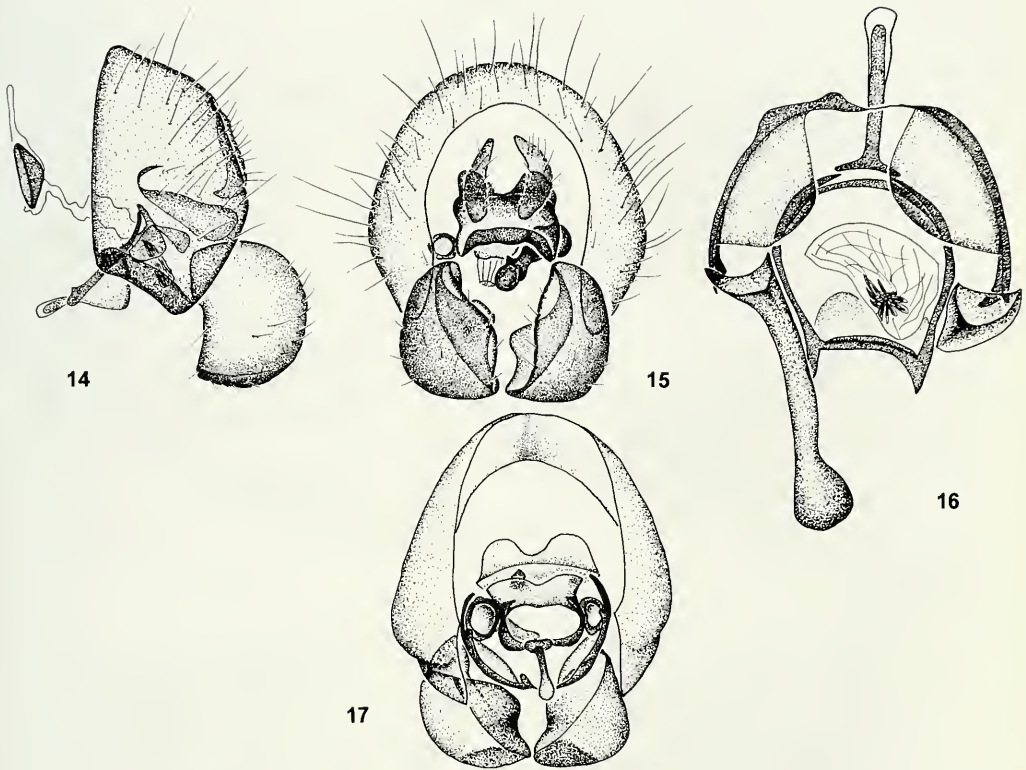
Male terminalia of *Lauxania bilobata* sp. n.: 10, lateral view; 11, posterior view; 12, ventral view, epandrium and surstylus omitted; 13, anterior view.

covered by a narrow brush of long, black setulae. Surstylus more robust; hypandrium anteriorly evenly closed, without a pair of lobes; posteriorly ending in a short rod (Figs 14-17).

DESCRIPTION

External characters. Shape, proportions, colouration and chaetotaxy as in *L. bilobata*. Hind tibia apically thickened due to a ventrally directed flattened plate which is covered with a brush of black setulae. In *L. bilobata*, the apex of the hind tibia is evenly swollen and the brush of black setulae covers almost the entire ventral half (Figs 3-4).

Male terminalia (Figs 14-17). Epandrium as in *L. bilobata*; surstylus more robust in both specimens dissected, but further material is needed to confirm whether this is a constant difference; bacilliform plate large, as in *L. bilobata*; hypandrium differing from the latter species by the presence of a short rod posteriorly and the lack of anteriorly directed lobes (Figs 12, 16); postgonites similar, but the knob of the left postgonite in *L. siciliana* dorsally more upcurved; aedeagus and its appendages as in *L. bilobata*.



FIGS 14-17

Male terminalia of *Lauxania siciliana* sp. n.: 14, lateral view; 15, posterior view; 16, ventral view, epandrium and surstylus omitted; 17, anterior view.

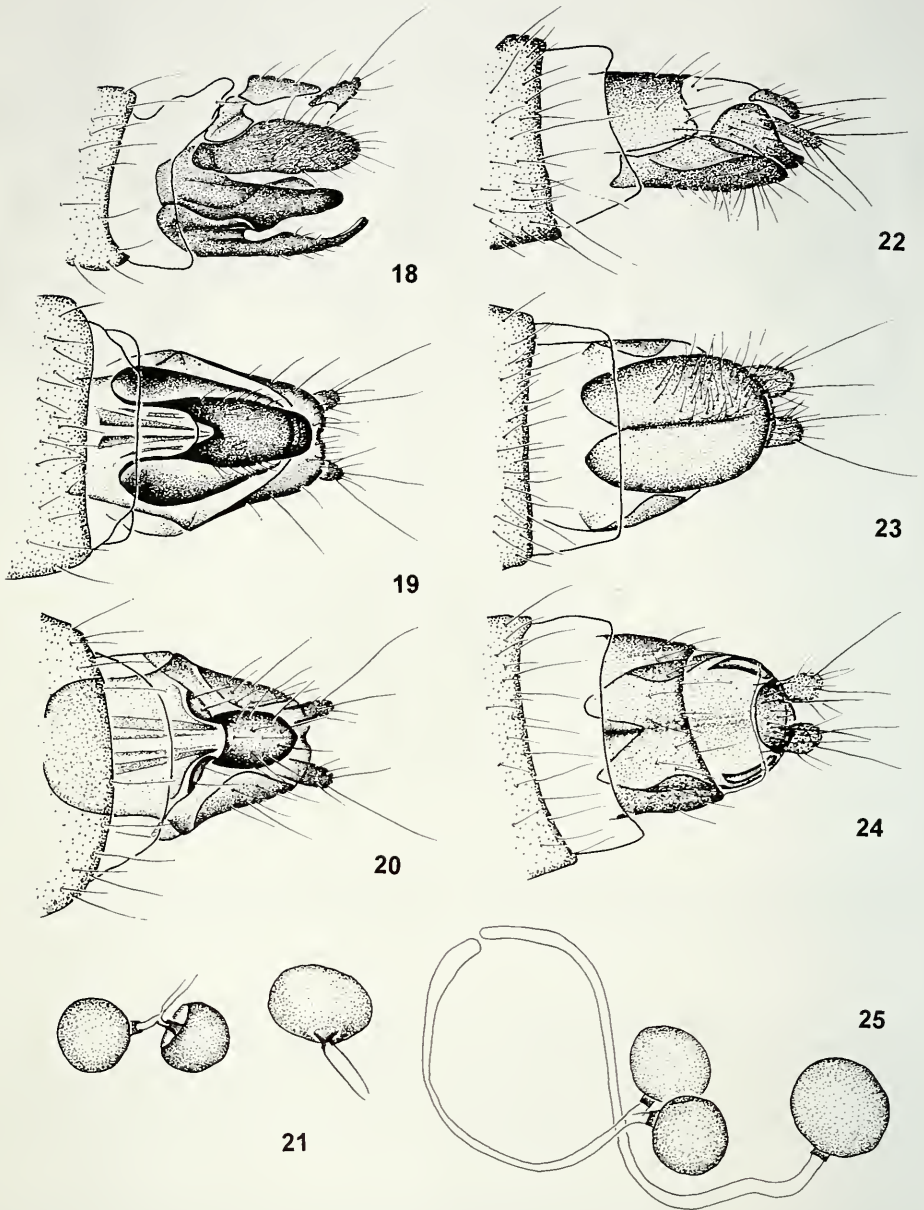
Female terminalia (Figs 22-25). Sternite 8 sheath-like, simple, ventrally with a shallow longitudinal depression which is covered with numerous erect, soft setulae; tergite 8 clearly separated from supra-anal plate; subanal plate rather densely setulose. Three spherical spermathecae of smooth surface present; the simple spermatheca larger.

BIOLOGY

The specimens were collected in the undergrowth of a rather open *Pinus* forest. They were swept from grass and some flowering Leguminosae.

DISCUSSION

This species forms together with *L. bilobata* a monophyletic group. The relationships with the other species of the subgenus remain unknown.



FIGS 18-25

Female terminalia and spermathecae of *Lauxania* s. str.: 18-21, *L. cylindricornis* (Fabricius); 22-25, *L. siciliana* sp. n. 18, 22, lateral views; 19, 23, ventral views; 20, 24, dorsal views; 21, 25, spermathecae.

KEY TO THE EUROPEAN SPECIES OF *LAUXANIA* LATREILLE

(sensu Shatalkin, 2000)

- 1 Anterior fronto-orbital seta inclined; arista either bare or thickened, but no distinct rays visible; hind tibia without dorsal preapical seta. Male: postgonites absent; aedeagus very large, strongly sclerotized, medially with 2-9 spines 2
- 1* Both fronto-orbital setae reclinate; arista with distinct rays; hind tibia with a dorsal preapical seta. Male: postgonites present, either asymmetrical or symmetrical; aedeagus soft, membranous (subgenus *Lauxania*) 3
- 2 First flagellomere short, barely more than twice as long as broad; head without produced fronto-facial angle; face bulging medially, transverse depression in lower fourth of head, reaching almost oral margin; mesonotum mat, thinly microtrichose (subgenus *Czernushka* Shatalkin) *L. albomaculata* Strobl, 1909
- 2* First flagellomere enlarged, at least 4 times as long as deep; antennae on a projection of face and frons, fronto-facial angle at 90°; face strongly concave, with transverse depression at about middle; mesonotum shining, without microtrichosity (subgenus *Callixania* Papp) *L. minor* Martinek, 1974
- 3 Head (Fig. 1): rays of arista almost twice as long as diameter of base of arista; scape and pedicel yellowish; their length subequal; horizontal depression in lower third of face straight, not reaching oral margin. Male: surstylus roundish-hemispherical, about as high as wide (Fig. 14); postgonites strongly asymmetrical, left postgonite much enlarged, halter-like; right postgonite rudimentary (Fig. 16); aedeagus encircled by the ring-shaped pregonite; hypandrium anteriorly without patch of black setae on ventrally directed, paired lobes (Fig. 17); bacilliform plate large, undivided (Fig. 15). Female: sternite 8 forming a simple plate (Figs 22-23) (female of *L. bilobata* unknown) 4
- 3* Head (Fig. 2): rays of arista about as long as diameter of base of arista; scape and pedicel brownish to blackish; scape about 1.5 times as long as pedicel; face with a distinct V-shaped horizontal depression in lower third which reaches oral margin medially. Male: surstylus basally globular, distally with a strong posteriorly directed protuberance (Figs 5, 9); postgonites symmetrical, small (Figs 8, 9); pregonites separated from each other, anteriorly with a pair of ventrally directed, more or less parallel-sided protuberances which end in a rather sharp laterally directed extension; hypandrium with patch of about 5 black setae on anterior paired lobes (Figs 5, 7); bacilliform plate divided into 2 only narrowly connected acute lobes. Female with complicated, laterally invaginated sternite 8 (Figs 18-20) *L. cylindricornis* (Fabricius, 1794)
- 4 Male: hind tibia apically with a rather large brush of black setulae on the whole ventral half (Fig. 3). Terminalia: surstylus slim, distinctly longer than wide in profile (Fig. 10); hypandrium anteriorly with a pair of conspicuous lobes; posteriorly truncate (Fig. 12) *L. bilobata* sp. n.

- 4* Male: hind tibia apically with a small, flattened plate on ventral side which is covered by a narrow brush of black setulae (Fig. 4). Terminalia: surstylus more robuste, only slightly longer than wide in profile (Fig. 14); hypandrium without paired lobes anteriorly, posteriorly with a pair of short rods (Fig. 16) *L. siciliana* sp. n.

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REFERENCES

- BECKER, T. 1895. Dipterologische Studien II. Sapromyzidae. *Berliner Entomologische Zeitschrift* 40: 171-264.
- BROADHEAD, E. C. 1984. Adaptations for fungal grazing in Lauxaniid flies. *Journal of Natural History* 18: 639-649.
- CZERNY, L. 1932. 50. Lauxaniidae (Sapromyzidae). In: LINDNER, E. (ed.). Die Fliegen der Palaearktischen Region. Volume V (1): 1-76. *E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart*.
- HENDEL, F. 1908. Diptera. Fam. Muscaridae. Subfam. Lauxaninae [sic]. In: WYTSMAN, P. (ed.). *Genera Insectorum, Fascicule 68, 66 pp. & 3 plates*.
- LATREILLE, P. A. 1804. Tableau Méthodique des Insectes. Classe Huitième. Insectes, Insecta (pp. 129-200). In: *Nouveau Dictionnaire d'Histoire Naturelle, Volume 24, Pars 6. Imprimerie de Crapelet, Paris. 238 pp.*
- LATREILLE, P. A. 1805. Histoire Naturelle, Générale et Particulière, des Crustacés et des Insectes. Tome 14. *Imprimerie F. Dufart, Paris. 432 pp.*
- LOEW, H. 1847. Ueber die europäischen Arten der Gattung *Sapromyza*. *Jahresbericht des naturwissenschaftlichen Vereines zu Posen 1846: 25-44.*
- MARTINEK, V. 1974. New European species *Lauxania minor* sp. n. and redescription of species *Lauxania cylindricornis* (Fabr.) (Diptera, Lauxaniidae). *Biologia Bratislava* 29: 609-617.
- MEIGEN, J. W. 1826. Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten, Volume 5: XII & 1-412. *Hamm*.
- MILLER, R. M. 1977. Ecology of Lauxaniidae (Diptera: Acalyprata). I. Old and new rearing records with biological notes and discussion. *Annals of the Natal Museum* 23: 215-238.
- PAPP, L. 1978. Contribution to the revision of the Palaearctic Lauxaniidae (Diptera). *Annales Historico-Naturales Musei Nationalis Hungarici* 70: 213-231.
- PAPP, L. 1979. 57 abraval. Korhadéklegyek-Pajzstetülegyek. Lauxaniidae – Chamaemyiidae. *Fauna Hungariae* 136: 1-59.
- PAPP, L. 1984. Family Lauxaniidae (Sapromyzidae) (pp. 193-217). In: Soos, A. & PAPP, L. (eds). *Catalogue of Palaearctic Diptera, Volume 9. Akademiai Kiado, Budapest, 460 pp.*
- PAPP, L. & DARVAS, B. (eds) 2000. Contributions to a Manual of Palaearctic Diptera. Volume 1. *Science Herald, Budapest. 978 pp.*
- PAPP, L. & SHATALKIN, A. I. 1998. 3.37. Family Lauxaniidae (pp. 383-400). In: PAPP, L. & DARVAS, B. (eds). Contributions to a Manual of Palaearctic Diptera. Volume 3. *Science Herald, Budapest. 880 pp.*

- PÉRUSSE, J. R. & WHEELER, T.A. 2000. Revision of the Nearctic species of *Lauxania* Latreille (Diptera: Lauxaniidae). *The Canadian Entomologist* 132 (4): 411-428.
- RONDANI, C. 1877. Species Italicae Ordinis Dipteriorum (Muscaria Rnd). Stirpis XIX. Sciomyzinarum. *Dipterologicae Italicae Prodrromus*, Volume VII, Pars Sexta, Fasc. II: 1-60.
- SHATALKIN, A. I. 1993. New species of Lauxaniidae (Diptera). *Russian Entomological Journal* 2: 105-118.
- SHATALKIN, A. I. 2000. Keys to the palaeartic flies of the family Lauxaniidae (Diptera). *Zoologicheskie Issledovania* 5: 1-102. (in Russian).
- STUCKENBERG, B. R. 1971. A review of the Old World genera of Lauxaniidae (Diptera). *Annals of the Natal Museum* 20 (3): 499-610.
- WESTWOOD, J. O. 1840. Synopsis of the Genera of British Insects. *In*: An Introduction to the Modern Classification of Insects. Volume 2. *London*. 158 pp.